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Plankton of the Bermuda Oceanographic Expeditions. VI. Bathypelagic Nemerteans Taken in the Years 1929, 1930 and 1931[1].

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(Plates I-X; Text-figure 1).

The Bermuda Oceanographic Expeditions, under the direction of Dr. William Beebe, were organized for the purpose of making an intensive faunal survey of a closely limited area of the deep subtropical ocean. The area chosen was a circle eight miles in diameter, with its center located at 32° 12′ N. Lat., 64° 36′ W. Long., a point about nine miles southeast of Nonsuch Island, Bermuda. (Text-fig. 1). The depth at this locality is 1,000 to more than 1,400 fathoms, but most of the nets were so arranged as to collect samples simultaneously at 100-fathom intervals from 500 to 1,000

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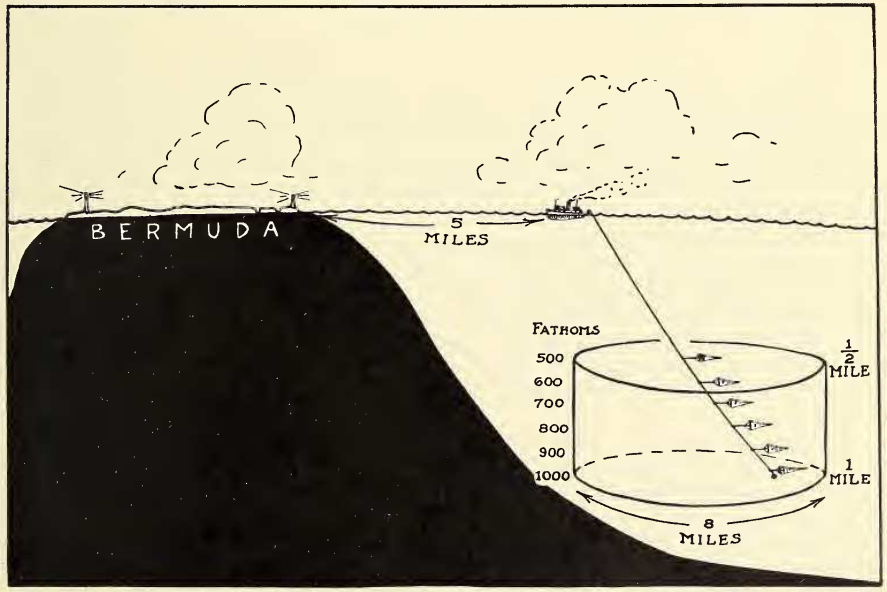

Text-figure 1.

Diagram showing location of Beebe eight-mile cylindrical trawling area and the arrangement of collecting nets in which the bathypelagic nemerteans of this report were obtained. (From Beebe).

fathoms inclusive. During the three summers, 1929 to 1931, a total of 1,042 nets one metre in diameter were drawn at these depths in all directions across this imaginary cylinder of water.

From the enormous volume of water which passed through these nets a total of 79 specimens of bathypelagic nemerteans was obtained. These represented 12 species, belonging to 10 genera, of which 6 species proved to be new to science. Many of the others are of great interest, not only because of the information which they furnish as to the geographical range of little-known species but more particularly because their study has supplemented our knowledge of the morphological peculiarities of several species of which only one or two individuals, representing only one of the sexes, had been previously recorded. No representatives of the group have been previously reported from this region. One species, *Pachynemertes obesa,* was a member of a new genus.

A list of the species secured by the expeditions, together with the number of specimens and the depth at which they were obtained, is as follows:

Species	Depth	No. Specimens
1. *Protopelagonemertes hubrechti* Brink.	1,400-1,800 m.	3
2. *Protopelagonemertes beebei* sp. nov.	1,646 m.	1
3. *Plotonemertes adhaerens* Brink.	1,300-1,830 m.	27
4. *Plotonemertes aurantiaca* sp. nov.	1,463 m.	1
5. *Crassonemertes robusta* Brink.	1,100 m.	2
6. *Pachynemertes obesa* gen. nov.; sp. nov.	1,646 m.	1
7. *Paradinonemertes wheeleri* sp. nov.	1,300-1,830 m.	6
8. *Planonemertes labiata* sp. nov.	1,800 m.	2
9. *Phallonemertes murrayi* Brink.	1,500-1,830 m.	2
10. *Chuniella lanceolata* Brink.	1,646 m.	1
11. *Nectonemertes mirabilis* Verrill.	1,300-1,830 m.	32
12. *Balaenanemertes minor* sp. nov.	549 m.	1
	Total	79

When it is realized that a total of only about fifty species of these bathypelagic nemerteans has previously been described from all the oceans of the world it is surprising to find so many as here recorded for a single locality. Only 6 of the 12 species were previously known to science and in only 2 of these, *Phallonemertes murrayi* and *Nectonemertes mirabilis,* were both sexes known.

The fact that in several cases only a single specimen of the species was obtained in a total of 600 to 800 nets lowered to the water layer which the species inhabits and drawn there horizontally for upwards of four hours indicates how exceedingly sparse the population must be, for the worms are so sluggish that they could not escape capture if the nets reached their exact position. This makes it seem probable that even this cylindrical mass of water, in spite of such intensive exploration, may still harbor additional species.

It has been found that water layers of similar physical and chemical characteristics extend for great distances in the oceans at depths of 1,000 metres or more. Consequently the bathypelagic species, even though they be limited to a particular water layer, may have a wide geographical distribution. It is consequently not surprising to find in the Bermuda collections species hitherto recorded only from such remote seas as extend from southern Greenland to the coasts of Great Britain.

At the Beebe eight-mile circle the temperature of the water at 1,200 m. is about 5.29° C. and the salinity 35.08; at 1,600 m. to 2,500 m. the temperature varies only from 3.96° to 3.21° C., the salinity from 35.04 to 34.96, the density 27.81-27.89, the oxygen 5.9 to 6.0 per L., the pH 8.06-8.15 and

the PO_4 45-48. Such stable conditions allow a great vertical range below 1,200 m. and an almost unlimited geographical range. But since the bathypelagic nemerteans are poorly adapted for active locomotion their rate of dispersal would be extremely slow were it not for the ocean currents which may carry them for very great distances.

With the exception of *Planonemertes*, which is known only from the Pacific ocean, all the genera represented in the collections have been previously reported for some portion of either the North or South Atlantic ocean. Curiously enough several genera, including *Dinonemertes Planktonemertes, Buergeriella, Amaueria* and *Natonemertes*, which are known to inhabit similar water layers in other parts of the North Atlantic, were not taken at the Bermuda area.

The bathymetrical distribution of the species collected at Bermuda is indicated in the following table (Table I).

TABLE I.

Bathymetrical Distribution of Bathypelagic Nemerteans Collected by 1,042 Nets Drawn Across the Beebe Eight-mile Cylindrical Trawling Area off Bermuda, Indicated by Number of Specimens Obtained at each Depth. (Depths at which these species have been previously obtained are indicated by "x." The figures representing temperature and salinity refer to the Bermuda area only).

Depth m.	Temp. °C.	Salinity.	*Pr. hubrechti.*	*Pr. beebei.*	*Pl. adhaerens.*	*Pl. aurantiaca.*	*Cr. robusta.*	*Cr. obesa.*	*Pa. wheeleri.*	*Pl. labiata.*	*Ph. murrayi.*	*Ch. lanceolata.*	*N. mirabilis.*	*B. minor.*
500	....	....	....	....	....	....	....	....	....	....	....	....	x	....
600	14.5	35.91	....	....	....	....	....	....	....	....	....	....	x	1
700	....	....	....	....	....	....	....	....	....	....	....	....	x	....
800	10.3	35.35	....	....	....	....	x	....	....	....	....	....	x	....
900	....	....	....	....	....	....	....	....	....	....	....	....	x	....
1,000	6.8	35.07	....	....	....	....	....	....	....	....	....	x	x2	....
1,100	....	....	....	....	....	....	1	....	....	....	....	....	x1	....
1,200	5.3	35.08	....	....	....	....	....	....	....	....	....	....	x2	....
1,300	....	....	x	....	2	....	1	....	1	....	....	....	x1	....
1,400	....	....	1	....	4	....	....	....	....	....	....	....	x2	....
1,500	....	....	....	....	6	1	....	....	....	....	1	....	x3	....
1,600	4.0	34.99	1	1	8	....	....	1	3	....	x	....	x5	....
1,700	....	....	....	....	3	....	x	....	....	....	x	1	x2	....
1,800	....	....	1	....	4	....	....	....	2	1	x1	....	x8	....
1,900	....	....	x	....	1	....	....	....	....	....	....	....	x6	....
2,000	3.5	35.04	x	....	x	....	....	....	....	....	x	x	x	....

KEY TO THE GENERA OF BATHYPELAGIC NEMERTEANS FROM THE BERMUDA AREA:

A. Body without tentacles in either sex.....B

B. Mouth and proboscis opening united; body slender, narrowed at both ends; proboscis sheath nearly as long as body.
Protopelagonemertes

BB. Mouth more or less widely separated from proboscis opening.....C
C. Musculature of proboscis sheath of interlaced circular, spiral and longitudinal fibers.....D
D. Body swollen and nearly cylindrical anteriorly, flattened and sharply recurved in posterior portion; with pair of specialized integumental glandular organs on ventral surface; proboscis very large.....*Plotonemertes*
DD. Body broad and more or less flattened; without specialized glandular organs .....E
E. Body broad, oval, thick; caudal fin narrow and sharply demarcated from body; mouth and proboscis opening not widely separated; intestinal diverticula much branched, with well developed ventral branch. *Crassonemertes*
EE. Body short, thick, rounded; caudal fin slightly differentiated; intestinal diverticula without ventral branches. .....*Pachynemertes*
EEE. Body much flattened; caudal fin broad and not sharply demarcated from body; mouth and proboscis opening widely separated; intestinal diverticula with rudimentary ventral branch or none.....F
F. Body rather narrow, with parallel lateral margins, much flattened posteriorly and continuing into flat caudal fin; mouth anterior to brain; spermaries of adult males with strong muscular walls and highly developed sperm ducts which continue beyond body as long, tubular penes. *Phallonemertes*
FF. Body oval and very flat; mouth on ventral surface of head, slightly anterior, beneath or slightly posterior to brain commissures, according to state of contraction of cephalic tissues; spermaries without external penes.....*Paradinonemertes*
CC. Circular and longitudinal muscles of proboscis sheath in separate layers .....G
G. Proboscis sheath composed of three more or less separate layers; body broad and very flat.....*Planonemertes*
GG. Proboscis sheath of two layers, outer circular and inner longitudinal; body slender, rounded anteriorly, tapered to narrow posterior extremity.....*Chuniella*
AA. Body with pair of lateral tentacles in one or both sexes; caudal fin highly developed .....H
H. Tentacles develop in adult males only; body slender.*Nectonemertes*
HH. Tentacles in both sexes; body broad.....*Balaenanemertes*

Genus *Protopelagonemertes* Brinkmann.

1. *Protopelagonemertes hubrechti* Brinkmann.

Brinkmann, 1917, 1917a, page 178; Coe, 1926.

(*Bathynemertes hubrechti* Brinkmann, 1917, 1917a; Wheeler, 1934).

(Figs. 16, 18, 28, 29-31).

Two typical specimens of this species were contained in the Beebe collections. Both were females, as was also the type specimen. One of these measured 30 x 5 x 2 mm. and the other 40 x 5 x 2 mm. The type specimen

measured 56 mm. in length and 10 mm. in greatest width. The body is pointed at both ends and is much more slender and relatively thicker than in most bathypelagic forms. A third specimen, also female, was evidently a giant of the race, for its bulk exceeded by many times the largest of the other individuals. It measured after preservation 78 mm. in length, 22 mm. in width and about 10 mm. in thickness (Figs. 18, 28). Its massive appearance seemed to indicate a distinct species, but careful study of the internal anatomy showed a general conformity with other individuals except for the vastly greater size of the organ systems.

Color in life red, scarlet or orange.

Mouth and proboscis opening united into a common atrium which may disappear when proboscis is partially everted. Intestinal diverticula with both dorsal and ventral lobulated branches. Lateral nerve cords with single fibrous core.

The relatively large proboscis is provided with 27-29 well defined nerves through most of the length of the anterior chamber, although some of the sections in one specimen show only 26 and in another 30; posterior to the nerve ring in the middle chamber the number of distinct nerves is reduced from 29 to 13-18. Specimens from the South Atlantic, referred to this species by Wheeler, had only 22, 24, 25 or 26 proboscidial nerves. The basis is sharply curved and is provided with numerous sharply-pointed conical stylets (Figs. 41, 42). About twenty accessory stylets of similar form lie in six small pouches on the adjacent wall (Fig. 42). The proboscis sheath reaches three-fourths to seven-eighths the length of the body. The sheath is composed of closely interwoven fibers.

The female has thirty or more pairs of large, elongated ovaries, each containing many ova. Each gonad is crescentic in section, with its tip near the median line when fully mature and with an arch above the nerve cord leading to the oviduct which opens lateroventrally. Many small ovocytes and a few larger ova are present in each gonad. The largest specimen was peculiar in having a single ovary in ventral side of body immediately posterior to the brain, in position where spermaries are found in many species. The male is as yet unknown.

Geographical distribution: The three specimens from the Beebe 8-mile cylinder were taken at depths of about 1,400 to 1,800 metres. Reported by Wheeler from the South Atlantic ocean west of South Africa. The type specimen was obtained west of Ireland at a depth of about 2,000 metres, indicating a wide distribution in both the North and South Atlantic oceans.

2. *Protopelagonemertes beebei* sp. nov.

(Figs. 25, 34).

The collection contained one specimen similar in general appearance to medium sized individuals of *P. hubrechti*, except flatter, but differing in having only 19-21 proboscidial nerves and in other morphological details as noted below.

Body elongate oval, pointed at both ends, flattened except at anterior end. Size of type specimen: 24 mm. long, 7 mm. wide and somewhat more than 2 mm. thick. Body walls thicker than in most bathypelagic species, both circular and longitudinal layers being well developed even on lateral margins; cephalic musculature particularly thick, with very strong muscular bands providing a firm proboscis insertion anterior to brain.

Color in life orange yellow, with paler lateral margins; color results mainly from globules in intestinal epithelium, thus leaving a longitudinal median dorsal band of creamy white; proboscis whitish.

Mouth and proboscis opening united; proboscis sheath about seven-eighths as long as body, composed of interlacing spiral and longitudinal fibers. Proboscis longer than body, with 20 nerves in most sections of an-

terior chamber, but with apparently one more or one less at intervals, due to variations in the interneural plexus; nerves form continuous ring in basis region; retractor passes through dorsal wall of sheath to become anchored in dorsal body wall. Basis of typical curved form and bears a dozen or more conical, toothlike stylets. Accessory stylets were not found in this specimen.

Esophagus slender, leading to remarkably voluminous stomach with much convoluted walls posterior to brain commissures. Pylorus both long and broad; caecal diverticula and upwards of 40 pairs intestinal diverticula have both dorsal and ventral branches, with lobes above and beneath the nerve cords.

Dorsal vessel large, passing beneath proboscis sheath near posterior end of pylorus to unite with lateral vessels at posterior end of body.

Brain large; nerve cords each with single fibrous core; dorsal nerve conspicuous in all sections.

Reproductive organs: Female with upwards of 30 pairs of ovaries, the most anterior pair situated on the ventral side of nerve cords immediately posterior to brain. Anterior gonads small, with only one or two large ova, but in middle of body gonads are very large, arching above nerve cords to open ventrolaterally. Each ovary contains several large ova and many small ovocytes, as well as a basal syncytium containing numerous small nuclei. Male unknown.

Geographical distribution: Known only from the Beebe eight-mile cylinder off Bermuda; taken at a depth of 1,646 m.

The species is named in honor of Dr. William Beebe, Director of the Bermuda Oceanographic Expeditions, whose ability and industry have made the Bermuda trawling area the most thoroughly explored portion of all the oceans.

Genus *Plotonemertes* Brinkmann.

3. *Plotonemertes adhaerens* Brinkmann.

Brinkmann, 1917, 1917a; Coe, 1926.

(Figs. 1, 7, 8, 14, 15, 22, 26, 27, 36, 37-42).

This species, of which only a single specimen has been hitherto reported, was represented by no less than 27 individuals in the collections studied. With the exception of *Nectonemertes mirabilis* it is evidently the most abundant species in the Bermuda area. Males, females and sexually immature individuals were represented.

The smallest specimen measured only 6 mm. in length and the largest 20 mm. The usually strongly recurved posterior extremity increases the difficulty of accurate measurement. Some of the variations in size and proportions are here indicated in millimeters: 6 x 1.5, 7 x 2, 7 x 2.5, 8 x 2.5, 10 x 3, 10 x 2, 11 x 2, 12 x 2, 12 x 3, 13 x 1.5, 13 x 2, 14 x 3, 15 x 2.5, 15 x 3, 16 x 5, 19 x 6, 20 x 5. The type specimen measured 30 x 9 mm. In most specimens the body is elongated oval or club-shaped, tapering gradually posteriorly, and usually with the flattened posterior end strongly recurved dorsally or, less frequently, ventrally.

Mouth and proboscis opening separate, the former usually with protruding circular lips due to partly everted stomach. Intestine with upwards of 50 pairs of much lobed diverticula, each with distinct dorsal and ventral branches; caecum with 6 pairs of similar diverticula. Proboscis sheath three-fourths to seven-eighths as long as body, composed of interlacing longitudinal and spiral fibers; proboscis relatively larger than in other bathypelagic forms and fully twice as long as body; attached posteriorly near end of dorsal wall of proboscis sheath. Number of proboscidial nerves variable, usually 26-28, but in some individuals only 24 or 25 were found

and in one specimen there were 30 distinct nerves anteriorly and only 25 farther back, while another had 28-34, of which several were smaller than the others. The variation is evidently due to the irregular distribution of nerves in the interneural plexus. Stylet basis curved at both ends, bearing numerous conical stylets; 6 small pouches each contain several more or less perfectly formed accessory stylets (Figs. 41, 42).

Lateral nerve cords with main ventral core and small, imperfectly separated, dorsal core; in some specimens dorsal core not distinguishable except near origin of dorsal peripheral nerves.

The glandular cutaneous organ found by Brinkmann on the ventral surface of the male occurs in both sexes, but is more highly differentiated in the male. This organ consists of deep convolutions of the surface epithelium, the lateral pair of folds being deeper than the others. In certain states of contraction this organ projects at an angle from the ventral surface when the body is recurved dorsally and may serve as an organ for the adhesion of the two sexes, as Brinkmann has suggested. The organ is not only highly glandular but is doubtless sensory as well, since it receives large branches from the adjacent lateral nerve cords.

Reproductive organs: Male provided with an irregular row of 7-11 spermaries opening ventrally on each side of body back of head; female with upwards of 30 pairs of narrow ovaries between intestinal diverticula and dorsal to lateral nerves; each ovary has several large ova and numerous small ovocytes.

Geographical distribution: The specimens here recorded were taken at depths of 1,300-1,800 m. on 16 occasions in the Beebe eight-mile area, while the type specimen was found near the middle of the North Atlantic (47° 34′ N. Lat., 43° 11′ W. Long.) at a depth of 2,000 m.

4. *Plotonemertes aurantiaca* sp. nov.

(Figs. 19, 20, 33, 43).

This new species of *Plotonemertes* differs from *P. adhaerens* in configuration of the body, in number of proboscidial nerves, in character of proboscis armature, in length of proboscis sheath, in character of glandular organ, in having but a single core in each of the lateral nerve cords and in other details noted below.

Body elongate, about half as thick as wide, flattened ventrally and rounded dorsally except in posterior sixth of body which is recurved behind glandular organ and flattened into a distinct caudal fin (Figs. 19, 20). Length of type specimen, 40 mm., width 11 mm., thickness in median line 5-7 mm. near middle of body and 1 mm. or less in caudal fin.

Surface epithelium well preserved over entire body; basement layer moderately thin and corrugated; muscular walls on lateral margins very thin; dorso-ventral muscles between intestinal diverticula with some giant fibers in addition to ordinary muscle cells.

Mouth separate from proboscis opening; proboscis sheath about two-thirds to three-fourths as long as body; composed of interlacing longitudinal and circular fibers except ventrally, where longitudinal fibers are few in number; proboscis very large, and much longer than body; 21 distinct proboscidial nerves. Epithelium with prominent papillae. Stylet basis pistol-shaped, with curved, rounded base and nearly straight principal axis; stylets lost before examination, but the rounded pockets on face of basis indicate that they were numerous (Fig. 33).

Color in life bright orange, with yellow margins and caudal fin and deep yellow proboscis. Color well preserved after several months in alcohol.

Stomach close behind mouth, walls much folded and evidently capable of extension as circular lips around mouth opening; pylorus wide but flat;

caecal and intestinal diverticula much lobulated, with ventral branches beneath nerve cords; 40-50 pairs intestinal diverticula.

Cutaneous glandular organs widely separated from each other in the female; epithelial convolutions with deep folds beneath basement membrane (Fig. 43); provided with large nerves from both median and ventral sides of lateral nerve cords.

Lateral nerve cords consist of but a single fibrous core; with the usual commissure on dorsal side of rectum and posterior to anastomosis of blood vessels.

Dorsal vessel large, enters rhynchocoel near posterior end of brain region, passes beneath proboscis sheath anterior to intestinal region and unites with lateral vessels at posterior end of body.

Parasites: The rhynchocoel contained many large gregarines.

Reproductive organs: Type specimen was female with 26-29 ovaries on each side (Fig. 43) situated close beside and above the nerve cords. Ova large, 3-6 in each gonad; oviducts open on ventral surface directly beneath lateral nerve cords. Male unknown.

Geographical distribution: Known only from the Beebe 8-mile area; depth 1,463 m.

Genus *Crassonemertes* Brinkmann.

5. *Crassonemertes robusta* Brinkmann.

Brinkmann, 1917, 1917a; Coe, 1926; Wheeler, 1934.

(Figs. 17, 21, 35).

The collections contained two specimens of this thick-bodied nemertean; only two others have been previously recorded. One specimen measured 16 mm. in length, 7.5 mm. in width and 2 mm. in thickness after preservation; the other was 23 x 12 x 2 mm.; the type specimen was 25 mm. long, 10 mm. wide and 4.5 mm. thick.

Mouth and proboscis opening separate; proboscis sheath extends nearly entire length of body; composed of interlacing spiral and longitudinal muscle fibers, with a tendency toward separate layers posteriorly; proboscis large, armed with rather large, moderately curved basis, bearing many sharply conical stylets and about a dozen shallow pouches of imperfectly formed reserve stylets; 20-23 proboscidial nerves; retractor passes through dorsal wall of sheath to become interlaced with muscles of dorsal body wall.

Upwards of 40 pairs of intestinal diverticula and 5 pairs of caecal diverticula profusely branched, both above and below lateral nerve cords. Nerve cords with single fibrous core anteriorly, but with small and incompletely separated dorsal core posterior to middle of body.

Reproductive organs: Female with 20-30 or more pairs of ovaries on dorsal side of nerve cords, opening lateroventrally. Male unknown.

Geographical distribution: Evidently widely distributed in the North Atlantic, the type specimen coming from northwest of Great Britain (57° 41′ N. Lat., 11° 48′ W. Long.) at a depth of about 1,666 m.; and the Bermuda specimen from a depth of about 1,100 m. Wheeler reports this species from off the west coast of Africa (6° 55′ N. Lat., 15° 54′ W. Long.) at a depth of less than 800 m.

Genus *Pachynemertes* nov.

The collections contained two specimens which have a superficial resemblance to *Crassonemertes robusta* but differ so widely in internal anatomy as to require the establishment of a separate genus in the family Planktonemertidae.

The genus *Pachynemertes* is diagnosed as follows: Body short, thick,

rounded; with slightly differentiated caudal fin; mouth and proboscis opening separate; intestinal diverticula without ventral branches; proboscis sheath composed of interlaced fibers; lateral nerve cords separated from ventral body wall by gelatinous tissue only.

6. *Pachynemertes obesa* sp. nov.
(Figs. 50, 51).

A single example of a short and thick-bodied nemertean bore the label "Grenadine animal," doubtless referring to the similarity of its shape to a miniature hand grenade. This species differs from *C. robusta* in the number of proboscidial nerves, in shape of stylet basis, in having less profusely branched intestinal diverticula, in the shorter length of the proboscis sheath and in other anatomical details.

Body after preservation short, oval, thick, with thin lateral margins posteriorly, continuing into a slightly bilobed caudal fin (Fig. 50). Length of type specimen 16 mm., width 8 mm., thickness 5 mm. Color in life unknown; body opaque and firm after preservation. Body walls thick on dorsal and ventral surfaces, but thin laterally.

Proboscis sheath extends about three-fourths the length of the body; circular, spiral and longitudinal fibers interlaced to form a single musculature. Proboscis slender; longer than body; provided with 14 distinct nerves and, in some sections, two additional ones of smaller size; stylet basis sharply curved, armed with upwards of 20 conical teeth (Fig. 51).

Mouth and proboscis opening well separated; mouth with protruding lips (Fig. 50); stomach much convoluted; slender pylorus of moderate length; about 35 pairs of intestinal diverticula, which are lobed, but not distinctly branched; ventral branches rudimentary, allowing lateral nerve cords to lie close to ventral body wall.

Dorsal vessel extends in rhynchocoel for a short distance, then passes beneath the proboscis sheath and continues posteriorly to join lateral vessels at posterior end of body.

Brain of moderate size; lateral nerve with single fibrous core.

Reproductive organs: The type specimen was an adult female with several ova in each of upwards of 30 pairs of ovaries.

Geographical distribution: Known only from the Bermuda area, where a single specimen was obtained at a depth of about 1,600 m.

Genus *Paradinonemertes* Brinkmann. (Emended).

According to the diagnostic characters of this genus as formulated by Brinkmann (1917), the mouth is situated behind the brain. The six specimens of a closely related species (*P. wheeleri*) from this collection, undoubtedly belonging to the same genus, prove that the position of the mouth relative to the brain is variable, depending on the state of contraction of the anterior portion of the body. Consequently the generic diagnosis must be emended to read: Body much flattened; mouth somewhat widely separated from rhynchodeal opening, situated anterior, ventral or slightly posterior to brain according to state of contraction of anterior portion of body; proboscis sheath extends into posterior third of body, its musculature composed of interwoven fibers.

7. *Paradinonemertes wheeleri* sp. nov.
(Figs. 2, 3, 9, 10, 11, 23, 45-49).

The collections contained 6 excellently preserved specimens of a new species of *Paradinonemertes*, the individuals of which differ from those

of *P. drygalskii* Brinkmann in many important respects, particularly in length of proboscis sheath, armature of proboscis, number of spermaries, character of lateral nerve cords and position of mouth.

Body translucent, broad, flat and thin, with broad caudal fin continuous with thin lateral margins of body; about 3 to 4 times as long as wide; measurements of several specimens were as follows: males, 14 x 5 x 2, 23 x 5.5 x 2; females, 11 x 3 x 2.5, 11 x 4 x 1.5, 13 x 4 x 2, 18 x 5 x 2, 42 x 15 x 2 (Figs. 2, 3, 9, 16, 23, 45, 46).

Mouth situated on ventral side of head; widely separated from proboscis opening but anterior to brain commissures except when cephalic musculatures are abnormally contracted, with protruding lips in most preserved specimens, leading directly to convoluted walls of stomach. In specimens having the proboscis fully retracted the mouth lies well anterior to the brain; the lips are widely protruded in the preserved specimens; the stomach walls have but few convolutions; 40-50 pairs of lobulated intestinal diverticula, with small or rudimentary ventral branches not extending beneath nerve cords.

Proboscis sheath about two-thirds to three-fourths as long as body, with interlaced muscular walls; proboscis about as long as body, with 12 or 13 distinct nerves; basis strongly curved, with numerous rather sharply conical stylets (Fig. 47). Proboscis sheath tapers to a point posteriorly and terminates in the parenchyma between the intestinal diverticula and without any fibrous connection with the dorsal body wall. Retractor muscles of proboscis are attached to sheath only.

Cephalic blood lacunae rather small; dorsal vessel enters rhynchocoel close behind ventral brain commissure, passes beneath the proboscis sheath a short distance farther back and continues posteriorly to join the lateral vessels at the end of the body.

Lateral nerve cord with small and imperfectly differentiated dorsal core.

Reproductive organs: Male with 3-5 pairs of spermaries opening on ventral surface behind brain and between anterior caecal diverticula. Female with 30-36 or more pairs of ovaries, each containing, when mature, 1 to 5 large ova and several small ovocytes; situated dorsally and laterally to nerve cords. (Figs. 45, 46).

Geographical distribution: Known only from the Beebe eight-mile area off Bermuda, where it was obtained at depths of 1,400-1,800 m.

The species is named in honor of Dr. J. F. G. Wheeler, Director of the Bermuda Station for Biological Research and a leading investigator of the bathypelagic nemerteans.

Genus *Planonemertes* Coe.

8. *Planonemertes labiata* sp. nov.

(Fig. 52).

Two specimens of this new form were obtained. One of these was an adult male measuring after preservation 21 mm. in length, 8 mm. in width and 2 mm. in greatest thickness. The other was a female about 16 mm. long and 6 mm. wide.

Body elongate oval, widest anterior to middle region, narrowing gradually toward posterior end; rather thin even when strongly contracted, and with very thin lateral margins continuous with thin caudal fin.

Color in life unknown; body translucent after preservation.

Body walls much thinner on dorsal surface than in many other forms and very thin laterally. Much gelatinous tissue between the muscle bundles and between the other organs in anterior half of body; dorso-ventral muscles

well developed laterally and posteriorly. Ventral muscle plate several times as thick as dorsal.

Proboscis sheath extends about four-fifths the length of the body; walls composed of three fairly distinct muscular layers, except for a short distance posterior to proboscis attachment where longitudinal and spiral fibers are interlaced. Farther back there is a well marked differentiation into inner circular, longitudinal and outer circular or spiral musculatures, although there are some spiral fibers extending between the inner and outer layers; inner circular layer about as thick as two other layers combined.

Only the posterior portion of the proboscis was retained. This part remained attached by the strong retractor to the wall of the sheath a short distance anterior to the end of the rhynchocoel (Fig. 52). The longitudinal fibers of the retractor were interlaced and in part continuous with the longitudinal musculature of the proboscis sheath; other fibers interlaced with those of the two other muscular layers of the sheath. Posterior to the retractor attachment the sheath becomes smaller and with thinner walls and ends in the gelatinous tissue between the intestinal diverticula. No statements can be made as to the armature of the proboscis or the number of proboscidial nerves.

Mouth subterminal, separate from proboscis opening; with enormously swollen lips in type specimen after preservation, due to strong contraction of cephalic tissues and partial eversion of stomach during extrusion of proboscis (Fig. 52). Caecal and intestinal diverticula much lobulated, but without ventral branches. Caecal diverticula extend forward to brain region. There are upwards of 20 pairs of intestinal diverticula.

Dorsal vessel enters rhynchocoel immediately behind brain, then passes through the ventral wall of the sheath after a short distance and continues posteriorly to join lateral vessels at posterior end of body.

Brain large; nerve cords with small but distinct dorsal fibrous core. The nerve cords are situated about midway between median line and lateral margins of body.

Reproductive organs: The type specimen was adult male with two clusters of small spermaries on the ventral side of the head, immediately posterior to the brain. (Fig. 52). The two clusters lie close to the median line; each contains about 6 to 8 thin-walled spermaries with slender sperm ducts, the ends of which protrude slightly from the body wall. The female has the usual arrangement of paired ovaries between the intestinal diverticula.

Geographical distribution: Known only from a depth of about 1,800 m. at the Bermuda trawling area. The single previously described species of the genus was taken in the Pacific ocean.

Genus *Phallonemertes* Brinkmann.

9. *Phallonemertes murrayi* Brinkmann.

Brinkmann, 1913, 1917, 1917a; Coe, 1926.

(Figs. 4, 24, 44).

Two specimens of this highly modified species were obtained by the Bermuda expeditions. One of these was a large mature male measuring 40 mm. long, 10 mm. wide and about 2 mm thick; the second was a young male 18 mm. long and 5 mm. wide.

Body elongated, with parallel sides, terminating posteriorly in a broad caudal fin, usually recurved but not sharply demarcated from body (Figs. 4, 24). Previously reported specimens varied from 34-61 mm. in length and 5-10 mm. in width. Color in life pink or red except caudal fin which is

translucent and colorless. Color due in part to numerous pigmented vacuoles in alimentary canal.

Mouth and proboscis opening separate; when the proboscis is partially everted the cephalic tissues may become so strongly contracted that the mouth with its circular protruding lips may come to lie beneath the brain and is thus widely separated from the proboscis opening. There are upwards of 40-50 pairs of intestinal diverticula and 5 pairs of caecal diverticula, somewhat lobed but without distinct ventral branches. Proboscis sheath about three-fifths as long as body, with interlacing fibers; proboscis armed with rather small, sharply curved basis bearing numerous conical stylets, together with several shallow pouches of reserve stylets; 13-17 proboscidial nerves, with broad interneural plexus.

Lateral nerve cords with distinct dorsal core; dorso-lateral nerves relatively large, with metameric connections with dorsal peripheral branches of nerve cords.

Reproductive organs: Male with 4-7 pairs spermaries in single row on each side of the body immediately posterior to the brain; each of these when fully mature is provided with a long tubular spermatic duct projecting as a penis far beyond the surface of the body (Fig. 44). Female with 20-30 or more pairs of ovaries, each of which produces upwards of a dozen ova and opens on ventral surface lateral to nerve cord.

Geographical distribution: Depth 1,500-1,800 m.; previously reported from various localities in the North Atlantic from Lat. 35° to near the southern point of Greenland, at depths of 1,600-2,000 m.

Genus *Chuniella* Brinkmann.

10. *Chuniella lanceolata* Brinkmann.

Brinkmann, 1917, 1917a; Coe, 1926.

The single specimen of this species contained in the collections is of particular interest because it represents the female of a form in which the male only was previously known.

Body elongated, not much flattened, narrowed and pointed posteriorly, without caudal fin; length of Bermuda specimen 5 mm., width 1 mm.; type specimen 10 x 2.25 mm. Body walls with thick dorsal and ventral longitudinal muscle plates, some of the muscular fibers being of comparatively gigantic size; circular muscular layer very thin.

Mouth and proboscis opening separate; upwards of 30 pairs unbranched intestinal diverticula and 5 pairs of similar caecal diverticula. Proboscis sheath nearly as long as body, walls of separate muscular layers; many of the spiral fibers are remarkable for their relatively enormous size and distinct cross striations. Proboscis large, about twice as long as body, with relatively large, curved basis and obtusely conical stylets; 21-23 proboscidial nerves.

Brain very large as compared with size of body; lateral nerve cords close against ventro-lateral body wall, with single fibrous core except for imperfectly differentiated dorsal core anteriorly.

Reproductive organs: Male with about a dozen spermaries in an irregular row on each side of body immediately posterior to brain. Female with upwards of 20 pairs of ovaries, each with two or three large ova.

Geographical distribution: The specimen here recorded came from a depth of 1,646 m.; the type specimen was taken in the North Atlantic southwest of Ireland at a depth of 1,000 m.

Genus *Nectonemertes* Verrill.

11. *Nectonemertes mirabilis* Verrill.

Verrill, 1892; Brinkmann, 1917, 1917a; Coe, 1926; Wheeler, 1934.

(Figs. 12, 13, 32).

Throughout the entire extent of the North Atlantic ocean this is by far the commonest of all species of bathypelagic nemerteans. A total of 125 specimens has been previously reported. It was represented in the Bermuda collections by 32 specimens, about equally divided between the two sexes and including several young individuals, the smallest being only 8 mm. long. All conformed with previous descriptions of the growth stages and adults. They were taken at various depths between 1,000 and 1,850 m., indicating a considerable vertical range in a single locality. Including one large male collected off the coast of Cuba by the Bingham Expedition, and not previously reported, the species is now known to extend through both the North and South Atlantic oceans from the latitude of southern Greenland, southward through the tropics to the latitude of South Africa.

Genus *Balaenanemertes* Bürger.

12. *Balaenanemertes minor* sp. nov.

(Figs. 5, 6, 53).

The single individual of this species found in the collections measured only 4 mm. in length, 2 mm. in width and 1 mm. in thickness, although it was a fully mature female with ripe ova. If this specimen is truly representative of the species, the individuals belonging to it are considerably smaller than those of any other known bathypelagic form.

The species somewhat resembles *B. lobata* and *B. musculocaudata* but differs in position and size of tentacles, in number of proboscidial nerves, in number of intestinal and caecal diverticula and in other details.

Body small, oval, somewhat narrowed posteriorly with distinct, bilobed caudal fin; tentacles small, situated well back of head, with imperfectly developed musculatures. Body walls extremely thin, with thin basement layer; very little parenchyma between intestinal diverticula and body walls.

Proboscis sheath nearly as long as body, with delicate musculature in two layers, inner longitudinal and outer spiral, except on ventral side, where longitudinal layer is lacking. Proboscis large, with 14 distinct nerves in most sections, although one of these may be lost in the interneural plexus in some sections and an additional one may be represented in others. Longitudinal muscles of retractor interwoven with both longitudinal and spiral layers of dorso-lateral wall of sheath at a point about four-fifths the distance from anterior to posterior end of body. Proboscis armed with curved basis of typical form bearing numerous small conical stylets, also with at least three shallow pouches of accessory stylets, of which as many as six may be present in one pouch.

Mouth well separated from proboscis opening; esophagus wanting; stomach simple, walls not convoluted in the type specimen; pylorus short; caecum with median branch reaching to brain and one or two pairs of voluminous, lobed diverticula, of which the anterior lobes reach the brain; pylorus in this specimen opens into dorsal wall of intestine in such a position as to make it uncertain whether the second pair of diverticula belong to caecum or intestine; about 13 pairs lobed intestinal diverticula, without ventral branch.

Lateral nerve cords lie close to latero-ventral body walls, with single fibrous core; with usual commissure above rectum; nerve cord muscles small.

Dorsal vessel ends blindly after a short distance in rhynchocoel. Cephalic lacunae large, with large corpuscles.

Reproductive organs: Female with 4-5 pairs of ovaries, each with single enormous ovum when mature. Oviducts large, opening ventrally between nerve cords and median line; ovarian wall much convulated after discharge of ovum (Fig. 53). Male unknown.

Geographical distribution: Known only from Beebe eight-mile area off Bermuda, where it was taken in a net drawn at a depth of about 549 m. None of the other nemerteans in this area was found so near the surface, but other species of the same genus have been collected at various localities at similar depths as well as very much deeper.

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EXPLANATION OF THE PLATES.

The lettering on the plates includes the following abbreviations:

a—anus
ac—anterior chamber of proboscis
br—brain
cg—cerebral ganglia
dv—dorsal blood vessel
ic—intestinal caeca
id—intestinal diverticula
go—glandular organ
ln—lateral nerve cord
lv—lateral blood vessel
m—mouth
ov—ovaries
p—proboscis
pa—proboscis attachment musculature
pc—posterior chamber of proboscis
ps—proboscis sheath
rc—rhynchocoel
ro—rhynchodeal opening
sb—stylet basis
sp—spermaries
st—stomach
t—tentacle

Plate I.

Figs. 1-15. Photographs of preserved specimens; all except Fig. 5 approximately one-third larger than natural size.

Fig. 1. *Plotonemertes adhaerens.* Body recurved dorsally; proboscis everted; lips protruding.

Figs. 2, 3. *Paradinonemertes wheeleri.* Male and female; body strongly contracted and much flattened.

Fig. 4. *Phallonemertes murrayi.* Male, showing 6 pairs of spermaries.

Figs. 5, 6. *Balaenanemertes minor.* Female with large ovaries and everted proboscis.

Figs. 7, 8, *Plotonemertes adhaerens.* Proboscis partially everted.

Figs. 9, 10. *Paradinonemertes wheeleri.* Female and young male.

Fig. 11. Same. Large individual with extruded proboscis.

Figs. 12, 13. *Nectonemertes mirabilis.* Young male and female, latter with extruded proboscis.

Figs. 14, 15. *Plotonemertes adhaerens.* Females with proboscis retracted.

Plate II.

Figs. 16-27. Photographs of preserved specimens; all approximately one-third larger than natural size.

Fig. 16. *Protopelagonemertes hubrechti.* Female with everted proboscis.

Fig. 17. *Crassonemertes robusta.* Female with partially everted proboscis.

Fig. 18. *Protopelagonemertes hubrechti.* Very large female. Posterior extremity broken off.

Figs. 19, 20. *Plotonemertes aurantiaca.* Large female with everted proboscis. Posterior end of body sharply recurved dorsally in position of glandular organ.

Fig. 21. *Crassonemertes robusta.*

Fig. 22. *Plotonemertes adhaerens.*

Fig. 23. *Paradinonemertes wheeleri.* Large female showing intestinal diverticula.

Fig. 24. *Phallonemertes murrayi.* Male, showing six pairs of spermaries.

Fig. 25. *Protopelagonemertes beebei.* Body abnormally flattened; proboscis partially everted.

Fig. 26. *Plotonemertes adhaerens.* Body compressed.

Fig. 27. Same. Small individual with body strongly recurved dorsally.

Plate III.

Fig. 28. *Protopelagonemertes hubrechti.* Very large female, showing dorsal and lateral keels; proboscis slightly everted; *A*, dorsal surface; *B*, lateral view; *C*, transverse section of body. Twice natural size.

Plate IV.

Fig. 29. *Protopelagonemertes hubrechti.* Portion of proboscis, showing portions of anterior (*ac*) and posterior chambers (*pc*), stylet basis (*sb*) and position of accessory stylet pouches.

Fig. 30. Same. Stylet basis more highly enlarged.

Fig. 31. Same. One of the six pouches of accessory stylets.

Fig. 32. *Nectonemertes mirabilis.* Anterior portion of body of young male, showing small tentacles and the position of the spermaries (*sp*).

Fig. 33. *Plotonemertes aurantiaca.* Stylet basis.

Plate V.

Fig. 34. *Protopelagonemertes beebei.* Female, showing partially everted proboscis (*p*), extent of proboscis sheath (*ps*) and position of ovaries (*ov*); *ic*, caecal diverticula.

Fig. 35. *Crassonemertes robusta.* Female, showing partially everted proboscis (*p*), extent of proboscis sheath (*ps*), ovaries (*ov*), stomach (*st*), and the profusely branched intestinal diverticula (*id*).

Plate VI.

Fig. 36. *Plotonemertes adhaerens.* Male with everted proboscis, showing extent of proboscis sheath, position of spermaries (*sp*) and glandular organ (*go*). Posterior extremity recurved.

Figs. 37, 38. Same. Ventral and lateral views of glandular organ (*go*).

Figs. 39, 40. Same. Configuration of glandular organ when posterior extremity of body is sharply recurved dorsally.

Fig. 41. Same. Proboscis with stylet basis.

Fig. 42. Same. Stylet basis and the six pouches of accessory stylets.

Plate VII.

Fig. 43. *Plotonemertes aurantiaca.* Female from ventral surface, showing small ovaries (*ov*) and the well-developed glandular organs (*go*).

Fig. 44. *Phallonemertes murrayi.* Male from ventral surface, showing extent of proboscis sheath (*ps*), arrangement of intestinal diverticula (*id*), position of mouth (*m*) and the six pairs of spermaries (*sp*), each with slender, protruded penis.

Plate VIII.

Fig. 45. *Paradinonemertes wheeleri.* Male, showing extent of proboscis sheath (*ps*) and the three pairs of spermaries (*sp*).

Fig. 46. Same. Female, showing position of ovaries (*ov*); *m*, mouth; *cg*, cerebral ganglia; *dv*, dorsal vessel; *sb*, stylet basis.

Fig. 47. Same. Stylet basis and stylets.

Plate IX.

Fig. 48. *Paradinonemertes wheeleri.* Female; left half from dorsal surface and right half from ventral surface, showing position of ovaries, oviducts (*od*) and intestinal diverticula (*id*); and extent of proboscis sheath (*ps*); *cg*, cerebral ganglia; *dv*, dorsal vessel; *ln*, lateral nerve cord; *lv*, lateral vessel; *sb*, stylet basis in proboscis.

Fig. 49. Same. Stylet basis.

Fig. 50. *Pachynemertes obesa.* Strongly contracted specimen, showing mouth and everted proboscis.

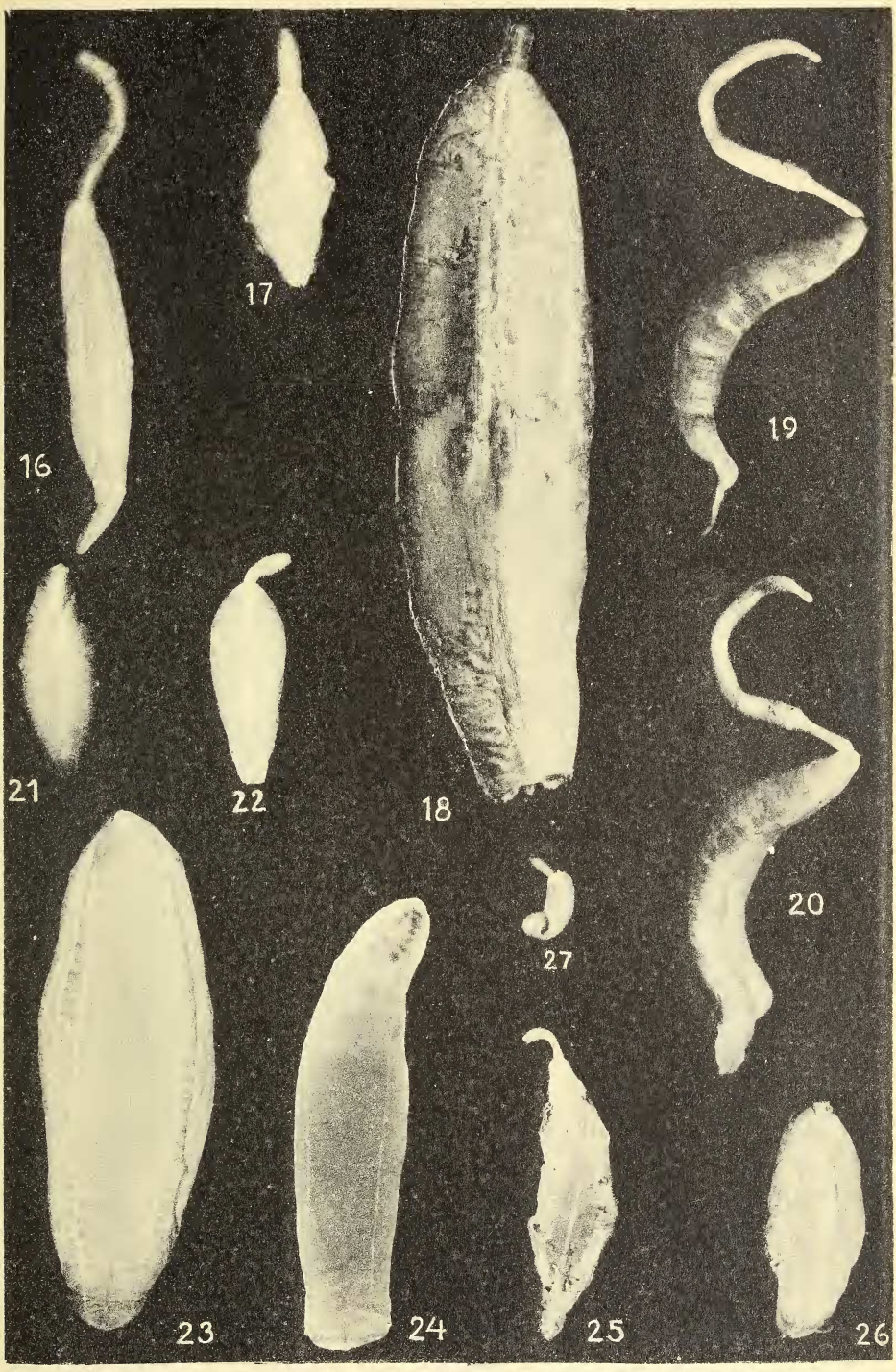
Fig. 51. Same. Outlines of stylet basis and stylets.

Plate X.

Fig. 52. *Planonemertes labiata.* Outline of body of type specimen, showing enormously swollen lips surrounding the mouth (*m*), the clusters of cephalic spermaries (*sp*), intestinal diverticula (*id*), rhynchocoel (*rc*), and posterior end of proboscis (*p*).

Fig. 53. *Balaenanemertes minor.* Female with three very large, ripe ova; *od*, preformed oviduct; *ov'*, recently emptied ovary; *id*, intestinal diverticula; *m*, mouth; *pa*, attachment of proboscis near posterior end proboscis sheath (*ps*); *sb*, stylet basis in everted proboscis; *t*, minute tentacle.

BATHYPELAGIC NEMERTEANS TAKEN IN THE YEARS 1929, 1930 AND 1931



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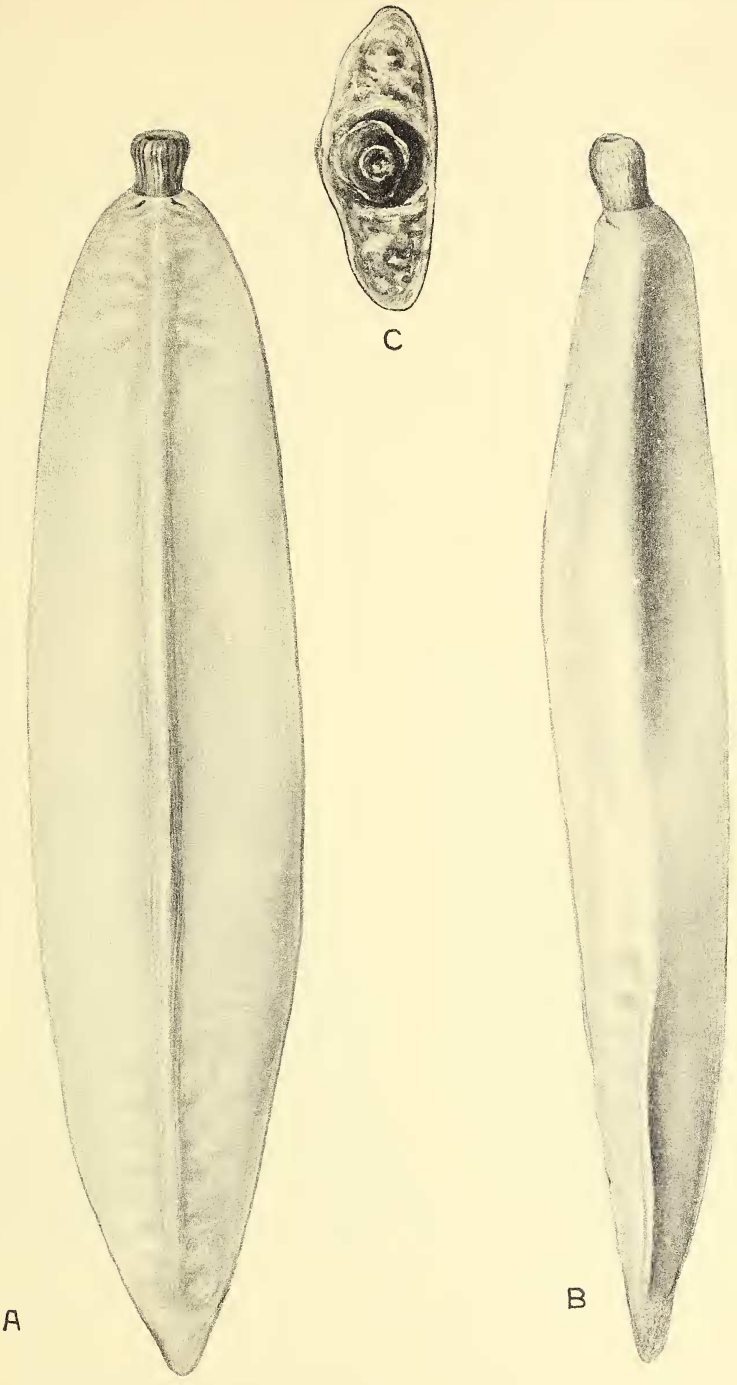

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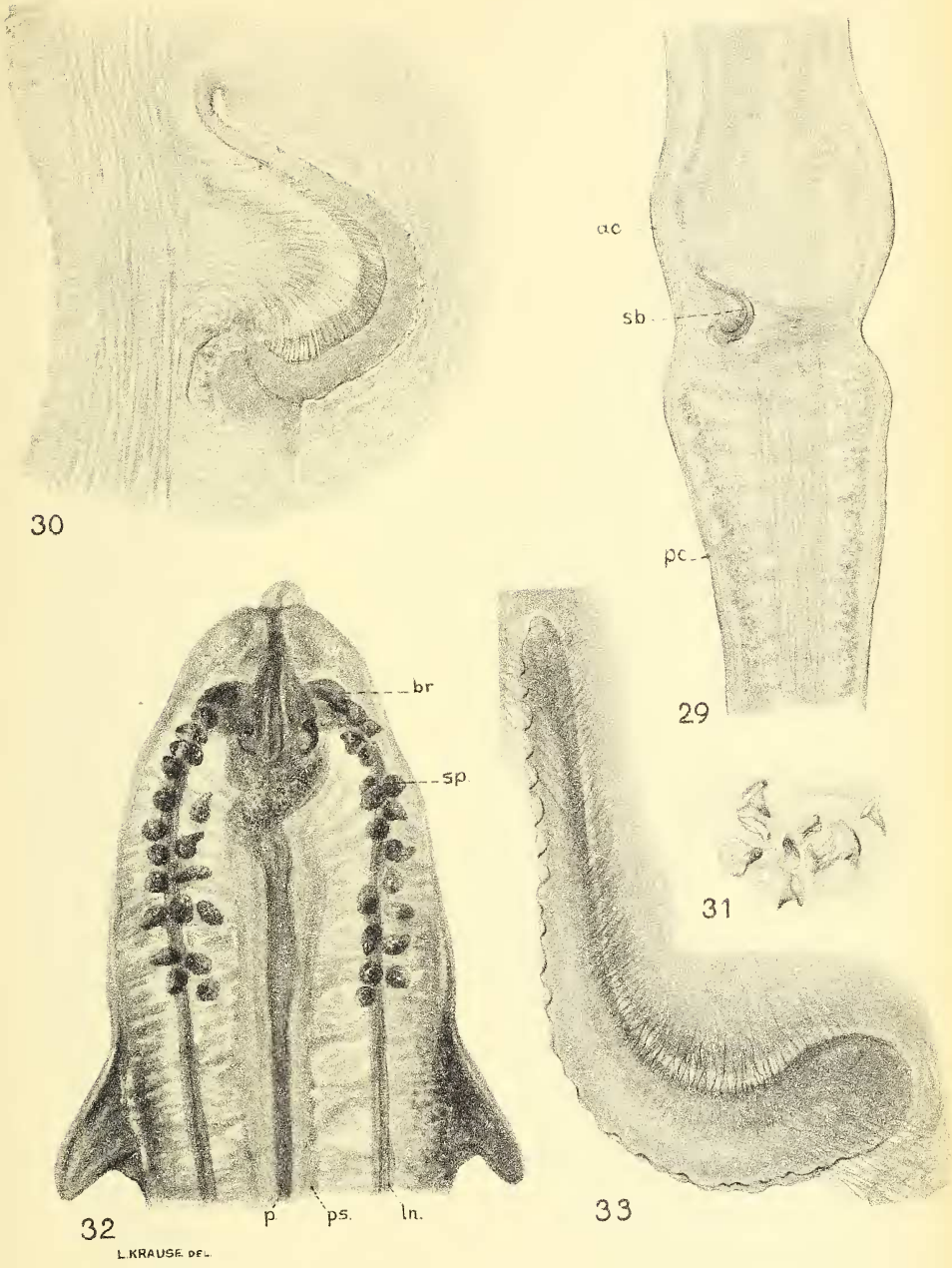

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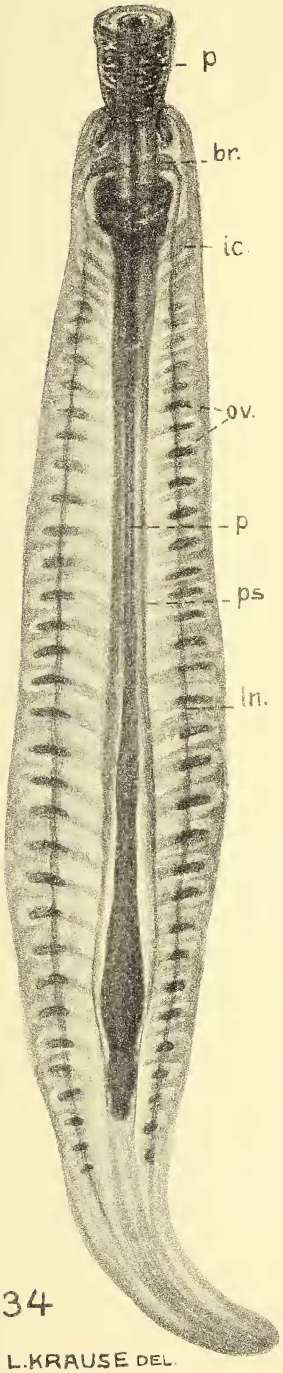

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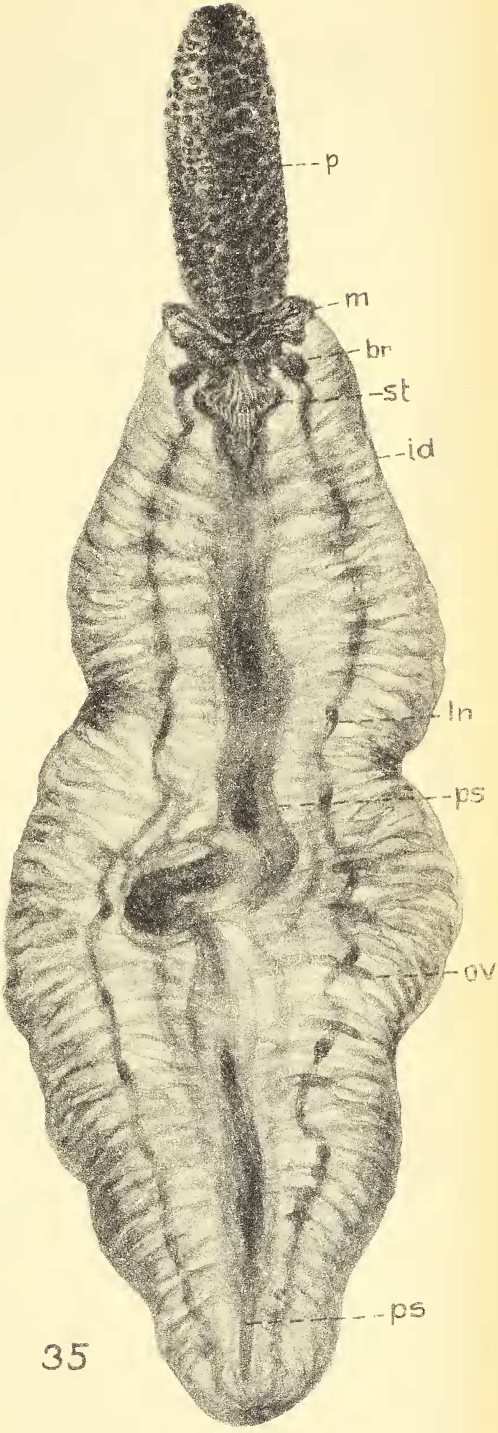

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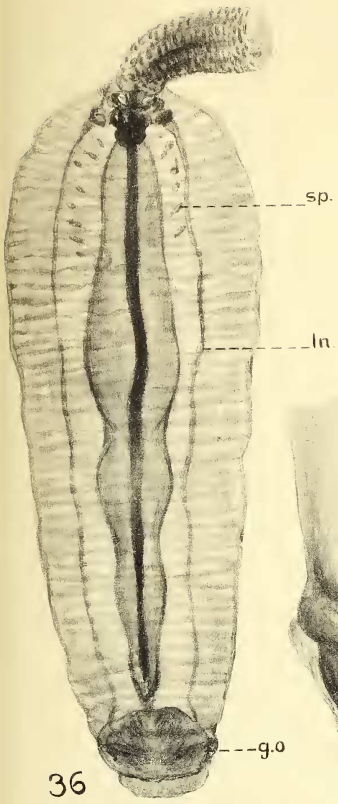

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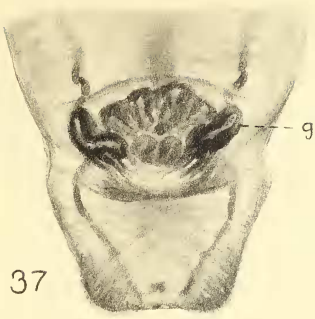

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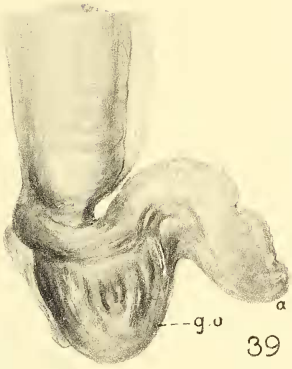

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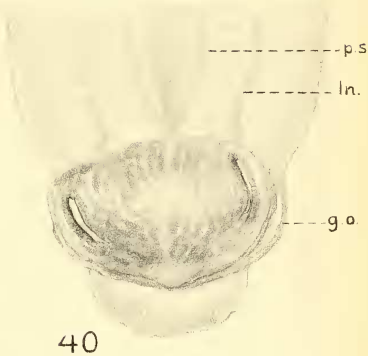

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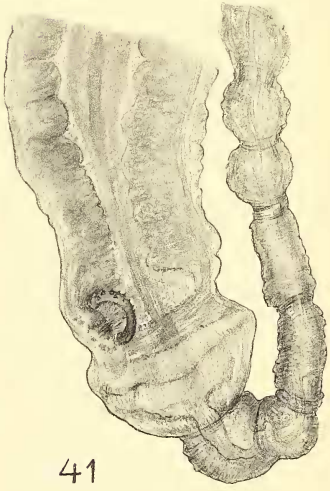

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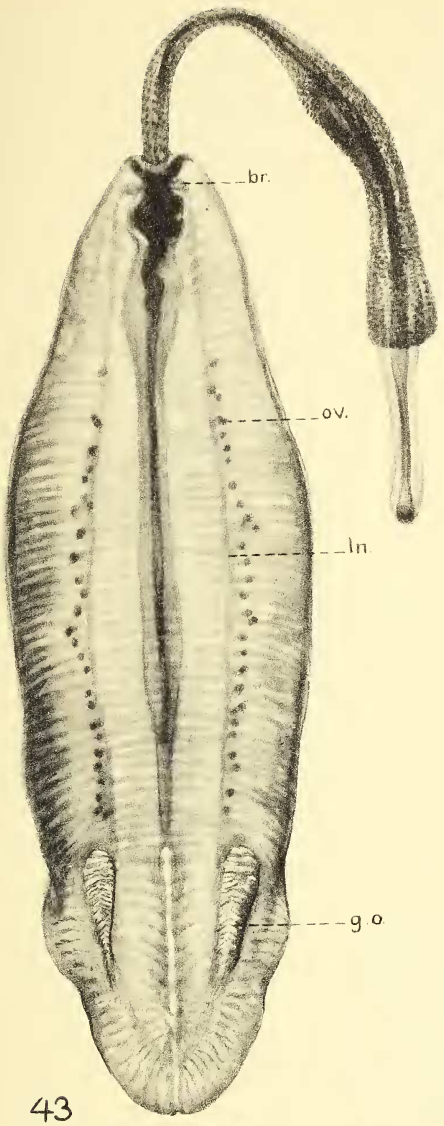
BATHYPELAGIC NEMERTEANS TAKEN IN THE YEARS 1929, 1930 AND 1931



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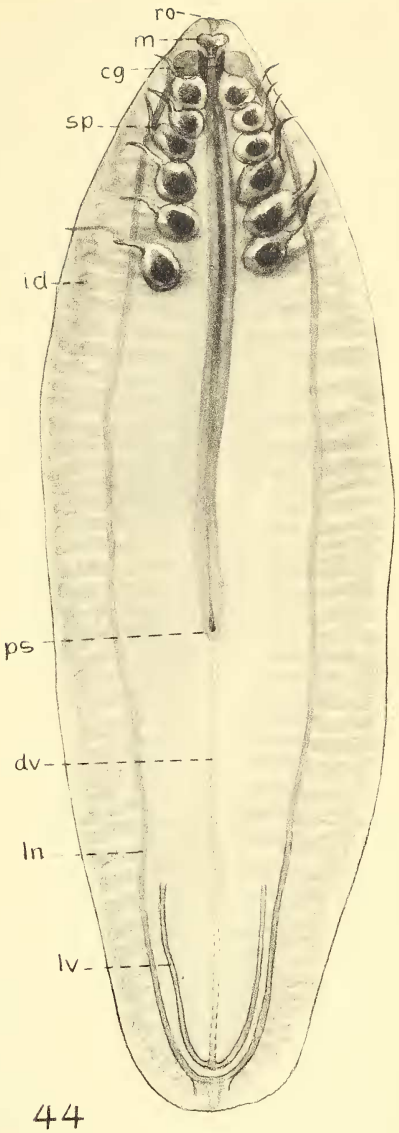

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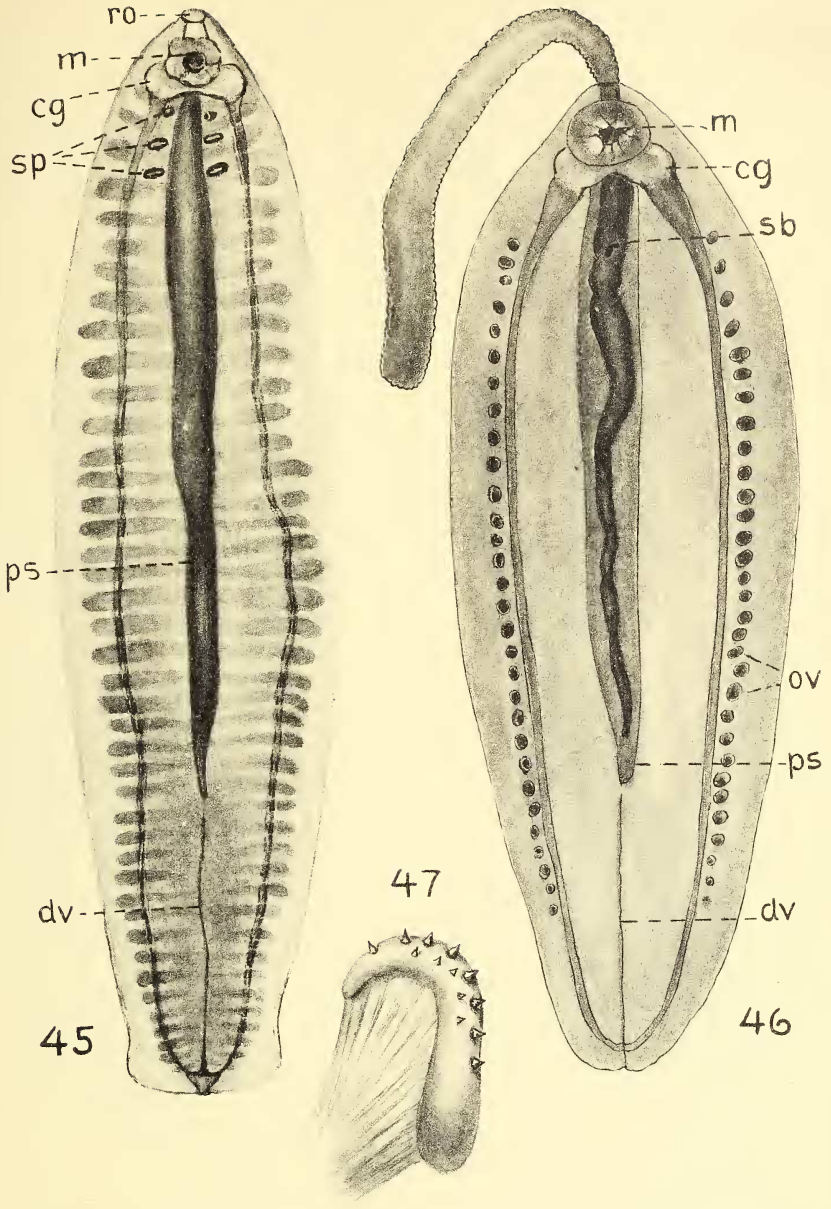

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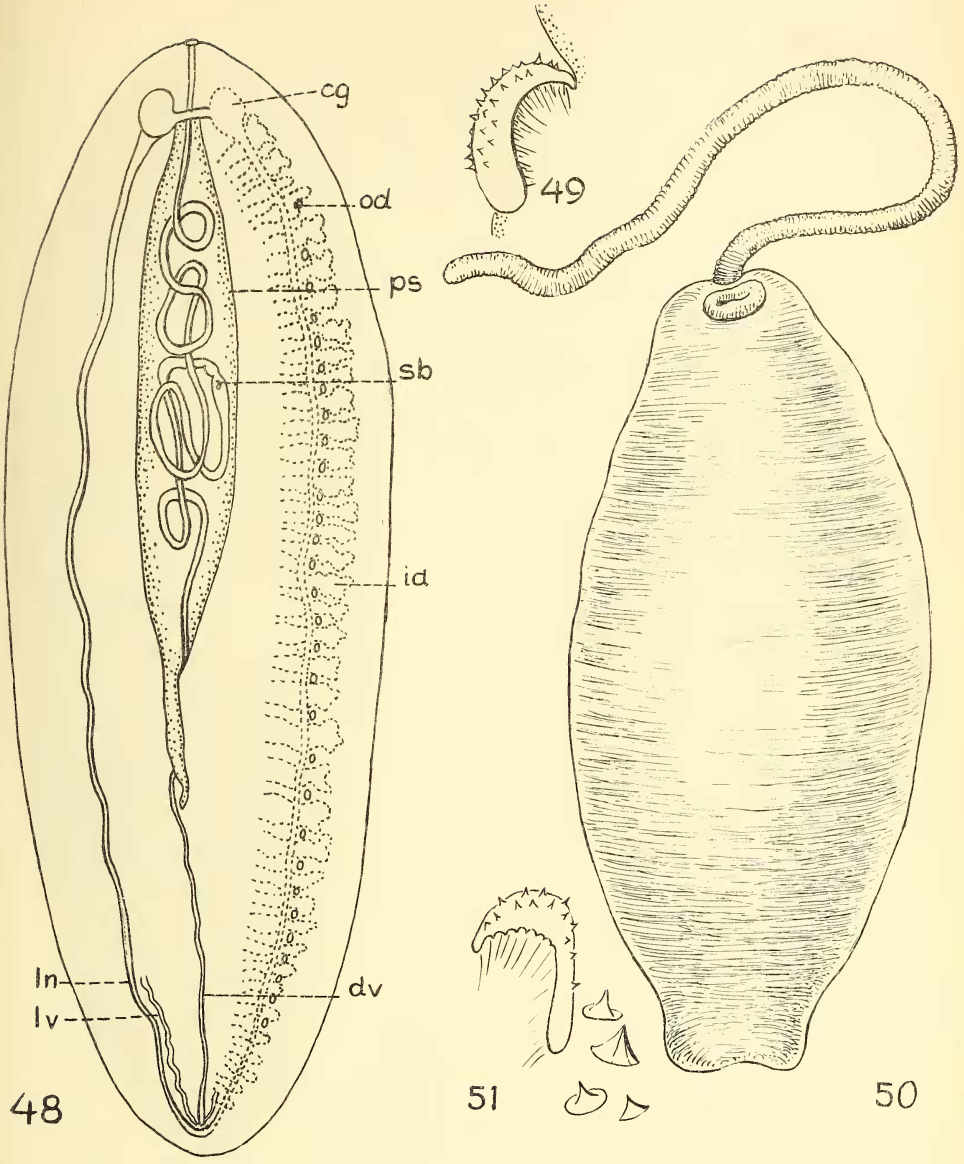

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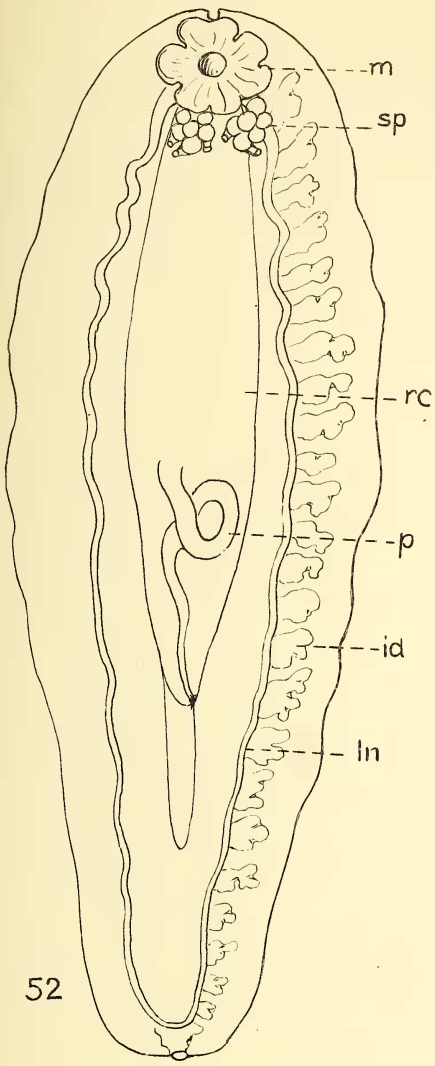

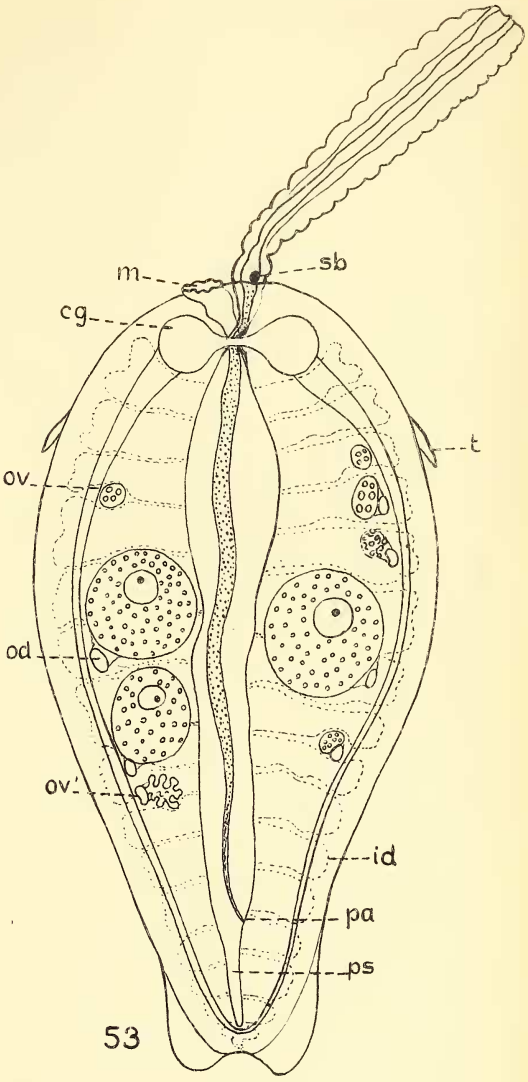

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